Chapter Table of Contents

1. OVERVIEW

Chapters 9 through 12 of this Handbook addressed several ways that information about existing and potential hazards in the workplace can be gathered and evaluated. Once these hazards have been identified, a prevention/control process must be implemented (Federal and DOE requirements for hazard abatement are found in 29 CFR Part 1960.30 "Abatement of Unsafe and Unhealthful Working Conditions" and DOE Order 440.1, paragraph 4j, respectively) to ensure that all known hazards are managed through final abatement. Questions that must be answered include:

- When are hazard prevention/control measures needed?
- What steps must be taken in cases of imminent danger?
- How can competing abatement needs be prioritized?
- What types of controls exist, and which type is preferred?
- How should abatement measures be tracked?

2. NEED FOR CONTROLS

Ideally, employee safety and health should be considered during the earliest stages of facility design or work planning. Realistically, workers are often faced with new, unpredicted hazards that must be abated as they arise.

Abatement of Existing Hazards

For hazards identified in the workplace, abatement actions that are prioritized according to worker risk should be promptly implemented and interim protective measures should be implemented pending final abatement. Risk assessment methodologies are addressed in Section 4 of this chapter and in **Appendices 13-1 and 13-2**. Hazards should be systematically managed and documented through final abatement or control.

3. CONTROL HIERARCHY

Hazard control methods should be selected based on the following hierarchy: engineering controls, work practice and administrative controls, and PPE.

Engineering Controls

Where controls are necessary to reduce worker risk from exposure to workplace hazards, engineering controls should be implemented to the extent feasible. Principal engineering controls include:

- Substituting a less hazardous substance or process.
- Enclosing the hazard.
- Locating hazardous operations or equipment in remote and/or unoccupied areas.
- Establishing physical barriers and guards.
- Using local and general exhaust ventilation.

Work Practice and Administrative Controls

The effectiveness of work practice and administrative controls depends on the ability of line management to make employees aware of established work practices and procedures, reinforce them, and provide consistent and reasonable enforcement.

Administrative controls include:

- written operating procedures, safe work practices, and work permits
- exposure time limitations
- limits on the use of hazardous materials and monitoring of such operations
- health and safety plans
- altered work schedules, such as working in the early morning or evening to reduce the potential for heat stress
- training employees in methods of reducing exposure

Personal Protective Equipment

When engineering and/or administrative controls have been considered and implemented and are not sufficient to fully protect the worker from a recognized hazard, PPE can be used to supplement these other controls as appropriate.

PPE is acceptable as a control method

- To supplement engineering, work practice, and administrative controls when such controls are not feasible or do not adequately reduce the hazard.
- As an interim measure while engineering controls are being developed and implemented.
- During emergencies when engineering controls may not be feasible.
- During maintenance and other non-routine activities where other controls are not feasible.

The use of 29 CFR Part 1910, Subpart I, Appendix B, "Non-Mandatory Compliance Guidelines for Hazard Assessment and Personal Protective Equipment Selection," will assist in determining when to use PPE and how to select the proper PPE for the hazard.

4. HAZARD ABATEMENT PRIORITIZATION

When unsafe or unhealthful conditions are identified as part of an OSH inspection (see Chapter 9), an abatement timeframe is often specified during the inspection closeout meeting. Such conditions should be abated within that specified timeframe or within 30 days of receiving a notice of unsafe or unhealthful conditions. If this is not possible, an abatement plan is required.

Prioritizing abatement actions using an agreed-upon risk assessment methodology enables a program manager to focus on the deficiencies that need attention first. The relative level of risk must be assessed for each identified hazard to ensure that hazard abatement efforts and resources focus

on addressing the most serious workplace hazards first. It may be best to assess risk at the time of inspection.

Risk assessment is an essential element of effective risk management. The assignment of risk levels provides a relatively simple and consistent method of expressing the risk associated with worker exposures to identified hazards. MIL STD 882C, *System Safety Program Requirements*, DoD Instruction No. 6055.1, "Department of Defense Occupational Safety and Health Program", and the *DOE Environment, Safety and Health Management Plan* describe acceptable risk assessment methodologies. An example of a straight-forward, simple risk assessment procedure and matrix is provided in **Appendix 13-1**.

Although important in prioritization and abatement planning, assigning a risk assessment code or level to a hazard should not be an impediment to quick abatement. If a hazard can be fixed immediately, assigning a risk category is not necessary, although organizations may prefer to assign one for trending purposes.

The priority assigned to the abatement of a specific hazard must first be determined based on the risk of injury or illness that the hazard presents to the worker; however, other factors may be considered, including:

- regulatory compliance
- resources (budget and personnel)
- complexity of abatement
- organizational mission

In some cases, it may be appropriate to address lower-level hazards before higher-level hazards if quick abatement is possible.

Imminent Danger

In the event that an imminent danger situation is discovered, actions must be taken immediately, either to correct the imminent danger condition or practice or to remove all employees from exposure to the imminent danger until the condition or practice has been abated.

An effective hazard abatement program is essential to ensure that workers are protected from exposure to current and future workplace hazards. The focus of this program must be the immediate control of identified workplace hazards. Where this is not possible, the program must ensure the protection of workers while awaiting final abatement action, and it must provide an efficient mechanism to ensure that all identified hazards are abated as quickly as possible.

5. ABATEMENT PLANS

Abatement plans are most effective when corrective actions are broken down into logical, sequential steps followed by estimated dates of completion and costs. This ensures that the problem has actually been corrected when the last milestone is completed. This also facilitates the tracking of progress and adjusts the overall completion date due to slippage

of an individual milestone. The plan should be updated as necessary until the hazard has been abated.

The plan should address essential requirements of interim employee protection, the reason for the extended corrective action timeline, and any other extenuating circumstances that may affect the abatement action.

It is a recommended practice to post the abatement plan in the area of the unsafe/unhealthful condition to inform employees of the action proposed by management. It is important for employees to become involved in developing and implementing corrective actions. Abatement plans should be provided to employee representatives and any local safety committees.

Interim Protection

While an abatement action is being carried out, employees must be protected from the identified hazards. A short-term strategy must be established that provides this interim protection. Methods such as administrative controls, work practice modifications, or PPE may be used to provide this protection. These measures must provide employees with protection that is equivalent to the permanent protection that will be provided by compliance with the relevant DOE-prescribed worker protection standard.

The level of risk associated with interim protective measures can be assessed to verify that equivalent protective measures are provided. The assessment of risk associated with interim protection, however, cannot and should not be used to lower the priority of final abatement actions. The hazard should be tracked and abated based on the initial risk assessment.

6. MANAGING HAZARD ABATEMENT

Hazard abatement management requires a mechanism to track all planned abatement activities through completion. Therefore, all hazards identified during inspections or evaluations should be recorded, regardless of whether the inspection or evaluation was conducted by DOE or external agencies such as OSHA. In addition, hazards identified by employees or line management should be recorded if they are not immediately abated.

Hazard abatement information may be in any format (electronic or paper file), as long as it (1) meets its purpose of documenting identified hazards and associated corrective actions through final abatement, (2) allows for appropriate planning and budgeting decisions, and (3) is retrievable.

Hazard Abatement Information

The following elements should be included in the documentation for each hazard:

1. location
2. date found
3. description of hazard
4. referenced worker protection standard
5. risk level
6. planned corrective action

7. estimated cost of abatement
8. interim protective measures
9. abatement period (number of calendar days)
10. scheduled abatement date
11. actual abatement date
12. record identification number (unique identifying number)

In addition, the information should also indicate if the actual corrective action differs from planned corrective action.

Note: Elements 1–5 are typically identified during the inspection.

Resource Restrictions

If abatement is beyond the control of the manager in charge, abatement should be elevated to the appropriate level for resolution. If this is the case, the request for assistance should define the problem and resources needed and prescribe the interim measures taken to protect the employees. In severe instances, this may involve stopping work. Organizations may need to obtain the required funding through the DOE ES&H Management Planning Process (see Chapter 2, Section 4, "Planning and Budgeting").

General Services Administration

Refer to Chapter 5, "Relationships with Other Organizations," for procedures to use when the GSA assists in the abatement of hazards.

Computer Programs

A computer-based inspection management system can be very helpful in scheduling inspections, tracking abatement and inspection results, and targeting inspection activities in high-risk or identified problem areas. A personal computer (PC) based MS-DOS program, the Safety Assessment/Facility Evaluation (SAFE) System, is available by calling (301) 903-6456. This program is free and can be beneficial to your organization in managing your inspection and abatement programs. **Appendix 13-2** gives more details about the SAFE system. ❑

RISK ASSESSMENT

Risk assessment is an essential element of effective risk management. The assignment of risk levels provides a relatively simple and consistent method of expressing the risk associated with worker exposures to identified hazards. These risk categories should be applied to:

- Evaluate relative risk associated with worker protection hazards identified during the analysis of facilities, equipment, or procedures.
- Compare relative levels of risk associated with existing workplace hazards in order to prioritize abatement actions.
- Evaluate residual risk (risk remaining after the implementation of controls) to determine the effectiveness of proposed interim and final abatement measures.
- Evaluate the effectiveness of alternative control measures.
- Determine if risk has been reduced or controlled to an acceptable level.

Methodology

The level of risk associated with a workplace hazard is expressed in terms of an assigned risk level of high, medium, or low, based on the Risk Assessment Code (RAC) calculated for the hazard. The RAC is assessed through the determination of the severity of the injury or illness that could result from the hazard and probability that such an injury or illness could occur.

Severity Code

The severity code is a classification of the severity of the most serious type of injury or illness that could reasonably be expected as a result of exposure to a specified workplace hazard.

Severity Code Criteria

Determination of the severity code is the first step in assessing the risk associated with a workplace hazard, and the code is assigned in accordance with the following criteria:

Hazard Severity	Severity Code
Catastrophic—Injuries/illnesses involving permanent total disability, chronic or irreversible illnesses, or death.	I
Critical—Injuries/illnesses resulting in permanent partial disability or temporary total disability in excess of 3 months.	II
Marginal—Injuries/illnesses resulting in hospitalization or temporary, reversible illnesses with a variable but limited period of disability of less than 3 months.	III
Negligible—Injuries/illnesses not resulting in hospitalization or temporary, reversible illnesses requiring only minor supportive treatment.	IV

Severity Codes for Health Hazards

The hazard severity code for health hazards is assigned based on the severity of the primary health effect that could result from an employee's exposure to a chemical or physical agent above a DOE-

prescribed exposure limit. The primary health effect is the health effect providing the basis for the DOE-prescribed exposure limit (e.g., cancer, liver damage, sensory irritation). Sources of this information include the American Conference of Governmental Industrial Hygienists (ACGIH) *Documentation of the Threshold Limit Values and Biological Exposure Indices*, OSHA standards, and National Council on Radiation Protection and Measurement (NCRP) reports. For chemical and physical agents for which no DOE-prescribed exposure limit exists, the assigned probability code is based on the primary health effect, as documented in MSDSs, and toxicology references, and other appropriate sources.

Probability Code

The probability code is an expression of the likelihood that a hazard will result in an injury or illness based on an assessment of applicable safety or health factors.

Relevant Factors

In the determination of probability codes, all relevant factors that may influence the likelihood that an injury or illness will occur should be identified, evaluated, and considered. Potential considerations in the assignment of probability codes include:

Safety Factors

The following factors should be considered when evaluating the probability that a safety hazard will result in an injury or illness:

- Number of employees potentially exposed, both concurrently and sequentially.
- Frequency of exposure, including the full range of possible frequencies, from one-time, short duration exposures to continuous daily exposure.
- Employee proximity to the hazard (e.g., from a location at the fringe of the danger zone up to the point of danger).
- Working conditions that may distract the employee or cause employee stress (e.g., complexity of the operation, proximity to other ongoing activities or workplace hazards, extended work hours and fatigue, workplace lighting or noise levels, etc.) and thereby increase the likelihood of an accident.

Health Factors

The probability code for health hazards is a statement of the probability that an employee will be exposed to a chemical or physical agent above a DOE-prescribed exposure limit. The probability code is determined as follows:

- Where established through monitoring (e.g., breathing zone monitoring, dosimetry, biological monitoring, noise measurements, wet bulb globe temperature measurements, etc.) that an exposure above the DOE-prescribed exposure limit exists, the probability code is “A”.
- Where no overexposures have been documented, the probability code is assigned based on the likelihood that an overexposure will occur. Factors to consider include employee proximity to (frequency and duration) areas with potential hazardous agent exposure; documented exposures above established action levels; chemical and physical characteristics of the hazardous agent; nature of the operation (e.g., storage, materials transfer); reliability or redundancy of controls; and number of employees potentially exposed to the hazardous agent.

Hazard Probability

The probability code is assigned in accordance with the following criteria:

	Criteria	Probability Code
Frequent	Likely to occur immediately	A
Probable	Probably will occur in time	B
Occasional	Possible to occur in time	C
Remote	Unlikely to occur	D

Risk Assessment Code and Risk Level

The RAC assigned to each hazard is an expression of risk which combines the severity code and the probability code. Using the matrix below, the RAC for a given hazard is assigned by (1) determining the severity code of the hazard (I, II, III, or IV) and entering the matrix along the corresponding row; (2) determining the probability code of the hazard (A, B, C, or D); and (3) moving across the row until arriving at the corresponding column. The Arabic number at the intersection of the appropriate row and column is the RAC for that hazard. The RAC relates directly to a risk level that can be used as a tool to determine priorities among and required oversight for hazard abatement activities.

Risk Assessment Code (RAC) Matrix

		Probability Code			
		A	B	C	D
Severity Code	I	1	1	2	3
	II	1	2	3	4
	III	2	3	4	5
	IV	3	4	5	5

Risk Levels

Hazard RAC	Risk Level
1 & 2	High
3	Medium
4 & 5	Low

Risk Assessment Codes and Risk Levels for Similar Hazards

When similar hazards exist (e.g., no guarding on similar types of power presses in the same workplace with comparable exposures), the RAC and risk level determined for one of the hazards may be assigned to the other similar hazards.

References

- American Conference of Governmental Industrial Hygienists, *Documentation of the Threshold Limit Values and Biological Exposure Indices.*
- U.S. Department of Labor, Occupational Safety and Health Administration Standards.
- National Council on Radiation Protection and Measurement Reports.

SAFE: SAFETY ASSESSMENT/FACILITY EVALUATION SYSTEM

Ready for use...

The Safety Assessment/Facility Evaluation (SAFE) System is now available for use by the DOE. The SAFE System consists of a users manual, tutorial, and 3.5" diskette. The diskette contains the SAFE database loaded with mock data that allow the user to perform the SAFE tutorial. A file to reset the system's database and remove all the mock data so users may enter their own information is also included.

Analysas Corporation developed SAFE for the DOE's Office of Occupational Safety and Health Policy (EH-51). DOE is making the system available to members of the extended DOE community as shareware, at no cost to them.

The system is a useful tool that helps DOE plan OSH compliance milestones and allocate resources and funding appropriately.

More about SAFE...

SAFE is an OSH Hazard Tracking System that manages compliance activities related to OSH regulations that are primarily in the 29 CFR 1910 series and are the general industry standards. The system has components to ensure compliance activities per DOE Order 440.1 and uses DOE documentation and guidelines for the basis of all its decision making.

The SAFE System consists of six primary sections:

- The File section contains the basic system file functions. This section allows the user to input information about his or her organization including the name of the organization. The company name will appear as a footer on all of the reports. This section also provides system information, including the number of records on file, and allows users to backup, restore, and reindex the SAFE database.
- The Tables section ensures that data, such as organization names, are uniform throughout the system. The system verifies information based on data previously entered and allows users to add, edit, or delete this information. The Tables section also includes modules that set parameters for use in evaluating data entered into the system.
- The Buildings section allows users to enter information pertaining to their facility. This includes general information about Active or Decontamination and Decommissioning (D&D) buildings, priority weighting factors to assist in the scheduling of inspections, and scheduling information.
- The Noncompliance section records the detection and abatement of facility noncompliances. This section determines those noncompliances requiring an OSH Hazard Abatement Log or Plan, tracks abatement progress, and records estimated and actual costs for the abatement of noncompliance. Data entry of noncompliance information is facilitated by a standardized language library of over 2500 of the most commonly cited standards. The standardized verbiage has been taken from the OSH Standard Element Paragraph (STEP) Manual. The system also prints tags for physical violations, including the generation of tag numbers and the ability to reprint a specific range of tag numbers.
- The Reports section incorporates standardized and user-generated, customized reports into a comprehensive package. This section includes an Ad hoc/Query feature that allows users to develop reports that are not included in the standard reports menu. These reports may be saved for further use. The Ad hoc/Query option will also interface with the OSH Noncompliance

standard reports to provide users with a management decision-support tool. Both standardized and customized reports can be sent to screen, printer, or ASCII file.

- The Graphics section allows users to generate illustrative documents that depict information found in the SAFE System database. Users are allowed to choose from a variety of presentation styles including two- or three-dimensional pie charts, two- or three-dimensional bar graphs, and line graphs, as well as a variety of color options. The system will print graphics in color or black and white, on paper or transparencies, or send the output to a PCX file.

The SAFE System also contains a comprehensive on-line help facility. Once the user accesses the on-line help, content-specific instructions on the options available are given. The user may also access a listing of all the help topics contained in the SAFE System and choose another help topic if further assistance is required.

One of the most important features of the SAFE System is how easy it is to use. The system is designed to require minimal training or reference to the user's manual. It contains extensive on-line help from virtually every screen. A new operator can comfortably navigate the system with little or no prior experience on the system.

SAFE is a PC-based system for a 386 or 486 computer with a minimum of 2Mb of RAM and will initially use 10Mb hard drive. The system also requires a 1.44 Mb 3.5-inch disk drive, VGA monitor and card, and MS-DOS version 4.01 or greater. An HP Laser Jet series II or greater is required to print reports and graphics. For color graphics, an HP PaintJet is required.